

Indoor airPLUS

Better Environments Inside and Out





AGENDA

- Special Demonstration
- Introduction of Panelists
- Brief Intro to IAQ & Indoor airPLUS
- How to Rate Indoor airPLUS homes
- Questions



EXPERT PANEL

Justin Erickson - E3 Energy, LLC



Indoor airPLUS Leadership Award Winner, 2010

Asa Foss - U.S. Green Building Council



LEED for Homes, Manager for Technical Development

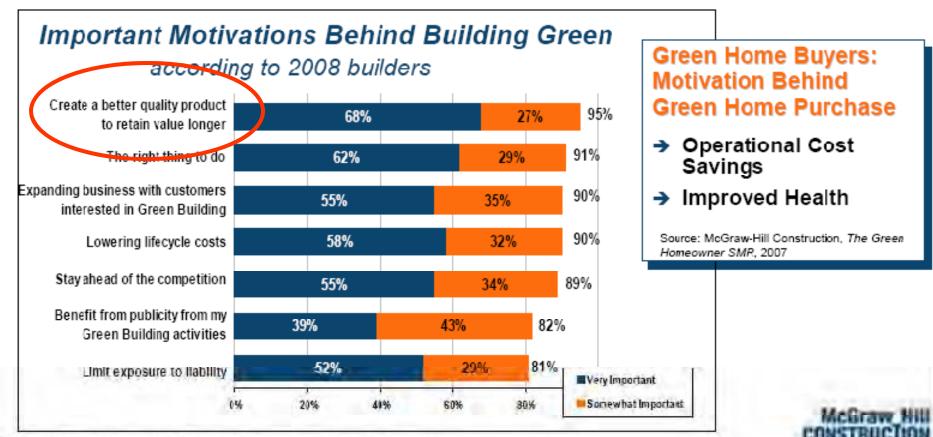
Kevin Gobble - Habitat for Humanity Int'l Sustainable Building and Design Specialist



What is a Green Home?

Quality Becomes Most Important Motivation for 2008 Builders to Build Green

→Top Motivator in 2006: "Right thing to do"



Quality Becomes Most Important

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Green Home Buyers: Motivation Behind Green Home Purchase

Operational Cost Savings

Improved Health

Source: McGraw-Hill Construction, The Green Homeowner SMR, 2007

0% 20% 41% 60% 30% Somewhat Important

McGraw HIL CONSTRUCTION

27

Health is a Top Motivator for Building or Buying a Green Home

RCLCO survey found that ~42% of buyers would be motivated to purchase a green home based on health benefits, compared with only 17% for energy savings and 12% for the environment.

Buyers who are aware of the link between IAQ and illnesses are unwilling to cut corners to protect the health of their families.

What is a Healthy Home?



Healthy Homes are ...



- Dry
- Pest-free
- Ventilated
- Safe
- Clean
- Maintained

"Free" of Known Health Risks,

including:

- -Lead, mercury, asbestos,
- -Tobacco smoke,
- -Radon,
- CO, NOx, & other combustion pollutants
- -Formaldehyde & other VOC's
- Asthma triggers (mold & other biologicals, particles, pesticides, and other chemicals)



Green, Healthy Homes Start With









The National Symbols for

Energy Efficiency & Indoor Air Quality



Qualified Homes Earn the Label





Why Do Consumers Care About Indoor Air Quality?

1,800,000

of ER Visits per year due to Asthma in the U.S.

19%

... of U.S. Households have at least One person with Asthma







Which families have asthma?











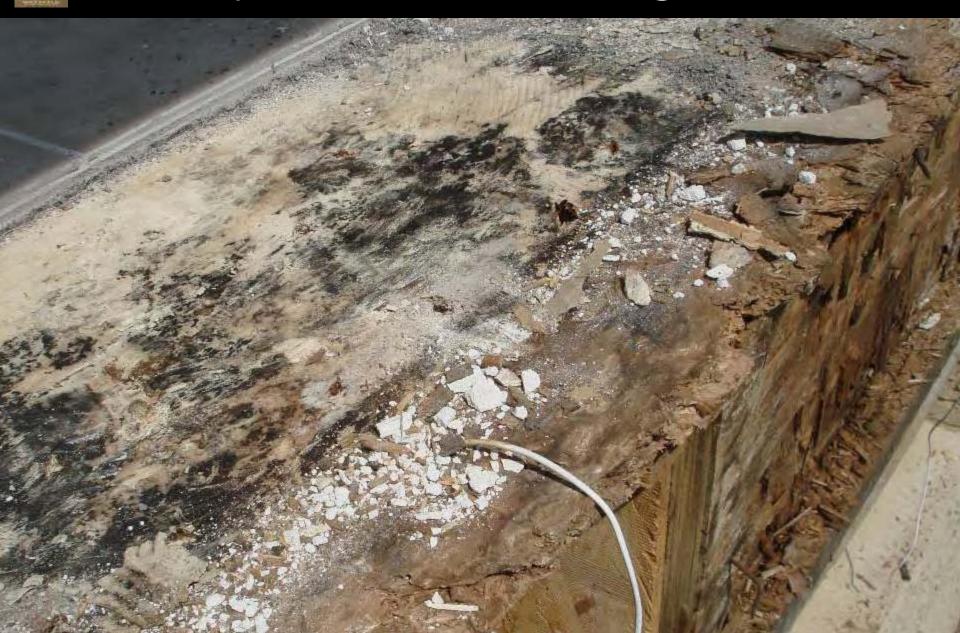
20-50%

Increased risk of asthma in damp houses





"My House is Killing Me"



How did this woman get lung cancer?



"People come into my office and say Doc Price I just don't understand it. How can this happen to me? I don't smoke. Nobody ever smokes around me. How can I have lung cancer?"

Dr. Lane Mathis Price



SURGEON GENERAL's WARNING: Radon causes lung cancer.

"I'm a survivor of radon induced lung cancer... A simple radon test at the time we bought our home in 1988 would have alerted me to fix our house before we moved in. If I'd only known..."

> Elizabeth Hoffmann CanSAR (Cancer Survivors Against Radon)





1 in 15





When outside air is unhealthy ...



Stay Inside?

2 to 5 times

EPA estimates 2 to 5 times higher chemical pollutant levels indoors

Why Do Builders Worry About Indoor Air Quality?

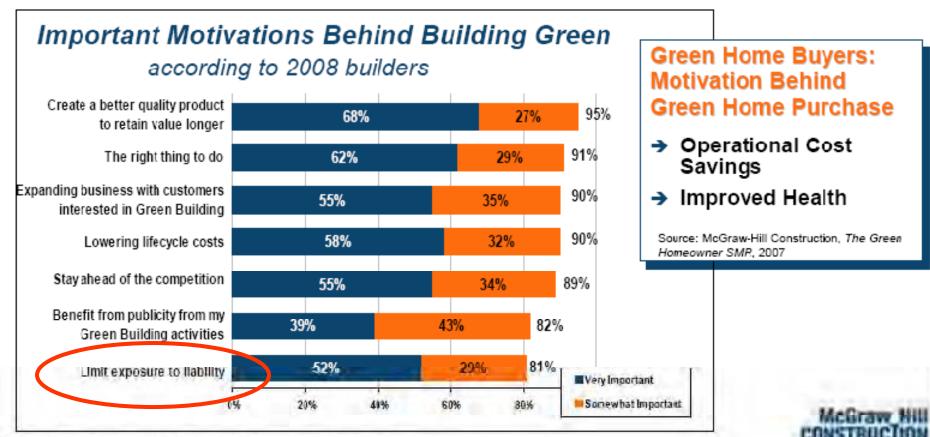


Defects Are Expensive to Fix

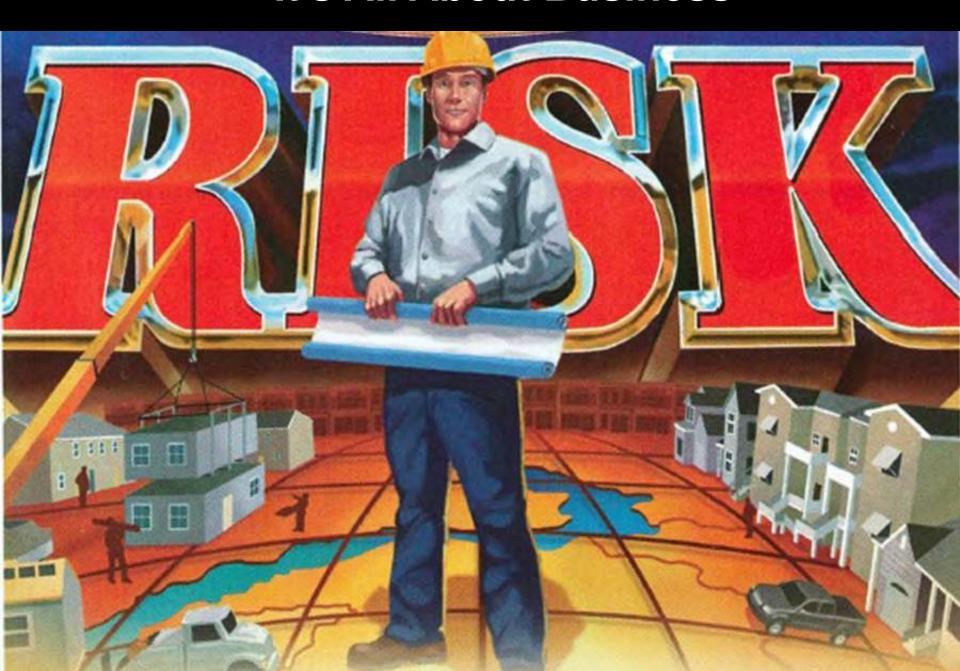


Quality Becomes Most Important Motivation for 2008 Builders to Build Green

→Top Motivator in 2006: "Right thing to do"



It's All About Business



How Do Raters Sell Indoor airPLUS?

Solutions



Some Defects Are Mysterious







How many HVAC contractors own a copy?



Happier Customers



"We decided to build a new house after restoring and residing in two 100-year-old homes in a row. We didn't even know the health problems attributed to those old drafty houses until we had our son. After running some low-level allergy symptoms for about a year, we moved into our new home which is Indoor airPLUS certified. The health issues cleared up immediately - for all of us. It's amazing what a little clean air can do!"



Indoor airPLUS Homeowner in Oklahoma City



Keeping Up with Competition









Awards



Add to collection

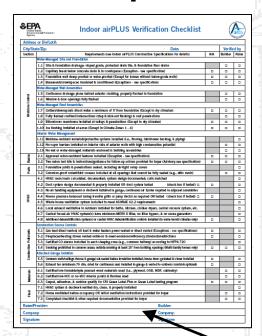


How To Rate Indoor airPLUS



3. Label Here

1. Inspect



Guidance for Completing the EPA Indoor airPLUS Verification Checklist:

- 1. Only ENERGY STAR Qualified Homes verified to comply with these specifications can earn the "EPA Indoor airPLUS" label. See EPA Indoor airPLUS Construction Specifications for full description of requirements, terms, exceptions, abbreviations, reference and climate map used in this checklist. Verification is not complete until this checklist is completed in full and signed.
- 2. Check see loa per line: "NA", "Builder Verified", or "Bater Verified". "NA" applies to opecifications that do not apply for specific conditions (e.g., climata) according to Exceptions described in the EPA Indiox aid/ULUS Construction Specifications, Check either Vallackie Verified" or Pater Verified" for all order inners. Builder rest and pink evirification checkel fit all priems and exchecked in the "Builder Verified" column, and by so doing accepts full responsibility for verifying that those items have met EPA Indiox aid*III Servain***
- When using Performance Alternatives (see 4.2 & 4.3), check tested box and include testing documentation in HERS/BOP file.
 Builder provides one copy of the completed/signed checklist to homebuyer. Provider or Rater files a copy with HERS/BOP and EMERGY/STAR documentation (i.e., Thermal Paras Checklist) for the home.
- 5. The Checklist may be completed for a batch of homes using a RESMEL approved sampling protocol when qualifying homes as ENERGY STAR. For example, if the approved sampling protocol requires rating one in seven homes, then the checklist will be completed for the one home that was rated.

Male: The ERR indicer seRFUS Construction Specifications are disaggeed to contribute to impressed indicer are quality (AGD in new homes compared with code which notes, therewer these measures alone compiler prevent all AG problems, Rather, ERR indicer are IVIUS is a way to reduce the islanfood of appearincing (AGD problems, Congard behavior in a bulb impressed the AGP or amonals, production in the Sons after occupancy and amoning inside may both neighbody impact the home is AGD and the participance of the appearities ERR indicer carPLUS measures.

Comments:

For more information, visit epa.gov/indoorairpius

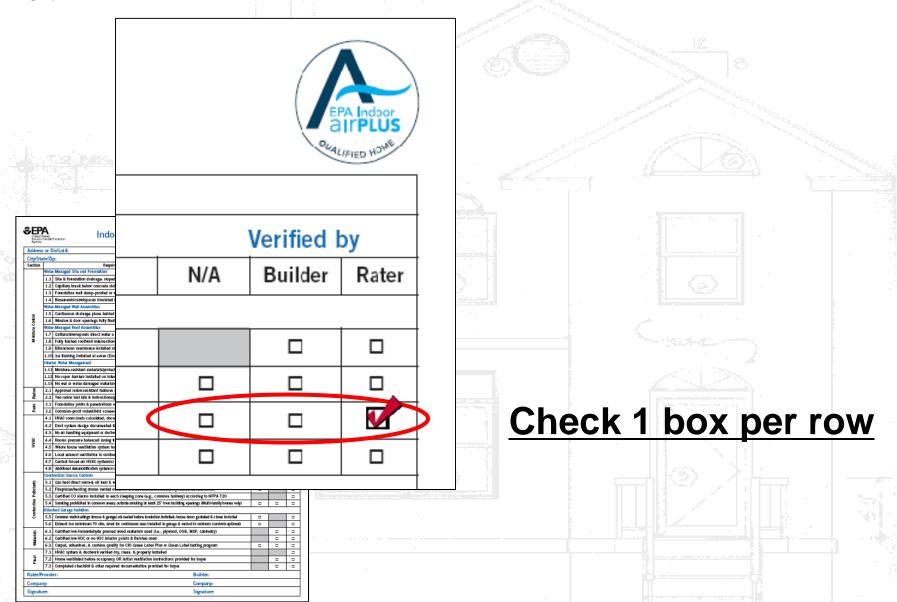


guidalines for energy efficiency set by ENERGY STAF
ENERGY STAF

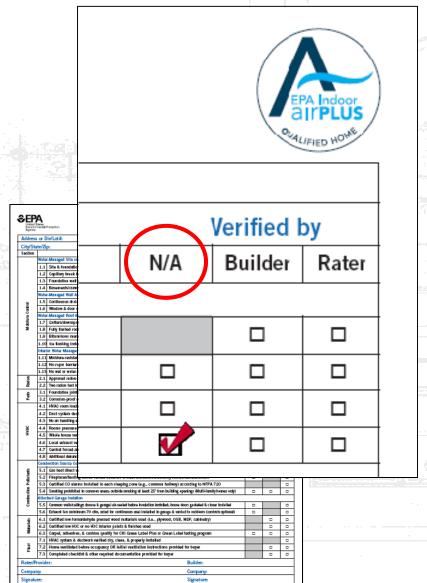
2. Sign Here











N/A = Exceptions

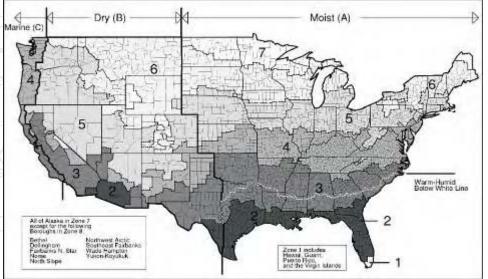
See Construction Specifications for details.

For Climate Exceptions:

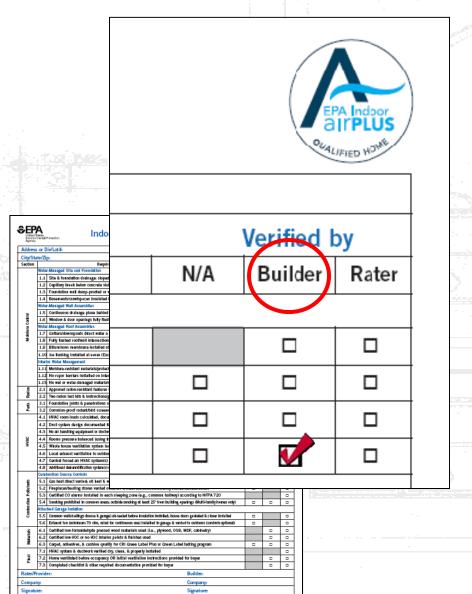
Use Figure 301.1, 2006 IECC®

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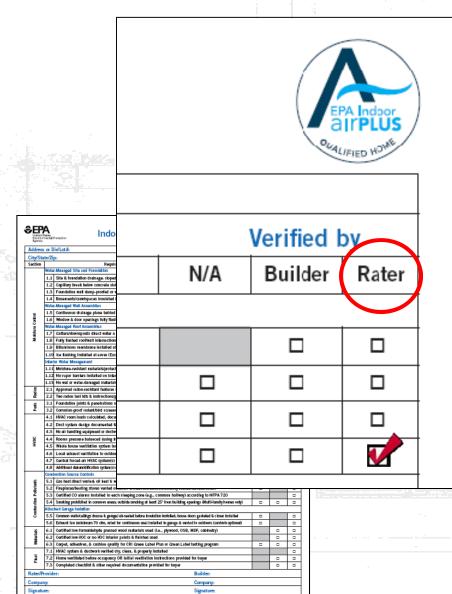


Builder = Self-certified

Specifications with no checkbox in the "Builder" column cannot be builder-verified.

Builder must sign completed checklist.



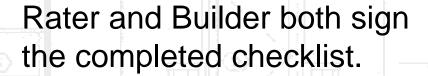


Rater = All the rest ...

Make sure there is one check per row.



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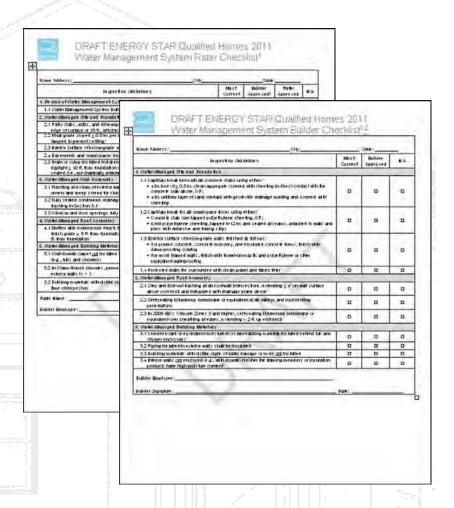


Rater files checklist with HERS rating documents.



What About ENERGY STAR v3?

Oh/Letki 123 Any Street Date: 4/19/o Requirements (see Indoor air SulS Construction Specifications for details) Notages are not recorded. See & foundation divinage, aloged guale, protected drain file, & foundation files durin; Cogalizary tools before concrete subsit & in consulpases (Exception - see specification) Pour soldiany and during protected in waiter provided (Except for homes without belone grade width) Bioser mention wait during protected in waiter provided (Except for homes without belone grade width) Bioser mention and during protected in waiter provided (Except for homes without belone grade width) Bioser mention and during protected in waiter provided (Except for homes without belone grade width) Window & door openings tasks thated Window & door openings tasks thated Bioser foundation (Except in cay climates) Window & door openings tasks thated See Window & door openings tasks thated Bioser foundation (Except in cay climates) Bioser foundation (Except in cay climates) Bioser foundation (Except in day climates)	9 NA	Verific Builder	Rational Distriction
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.5 Common wallsterlings thouse & gategal an ossisci before insulation installed; house doors gastered & closer installed.	- 12		1
6 Extracel for Previouse 70 che, rated for continuous used mateBed in galage & verted to outsions (controls optional)	-11		
1 Certified low-formuldehyde pressed wood materials used (i.e., plywood, QSB, MDF, cabinetry)		K	
.2 Certified low-VOC or no-VOC interior paints & finishes used		19	1
1.3 Carpet, adhesines. & cashion qualify for CRI Green Label Plus or Green Label testing program	.12	18	1
1. HARC system & ductorick scriffed dry, Flouri, & property imhalfed			1
2 Horse ventilated before occupancy OR initial ventilation instructions provided for buyer		100	+1
7.3 Completed checklist & other required documentation provided for buyer		09/	1
side: Tess N Certify Bulder: Bill Di	+w	right	
	Emplaceathwaters stores extent outdoors & meet entostane/efficiency standarda/restrictions Certified CO alarms installed in each sleeping zone tell, comman halfweyl exceeding to NPPA 720 4 Sending professor in comman areas, outside analysing at least 25 from balling operage to NPPA 720 4 Sending professor in comman areas, outside analysing at least 25 from balling operage to NPPA 720 5 Certified Congre Installed 6 Debugs Installed 6 Debugs and information 70 cless rated for certificates upon installed in galaxy & rested to estitions (terrificial operage) 6 Debugs and information 70 cless rated for certificates upon installed in galaxy & rested to estitions (terrificial operage) 6 Debugs and information 70 cless rated for certificates upon installed in galaxy & rested to estitions (terrificial operage) 6 Debugs and information of the rest operage of the rest operage of the standard operage of the certificates and the certificates are certified on the restriction operage of the certified operage of the certified operage of the certified operage of the restriction includities provided for buyer operage of the certified ope	Two salars test kips & instructional guidance for follow-up actions provided for fusion (Advisory-see specification) Foundation justs & percebulities socied. Including ai-right sump covers Corpsion proof redembland acromum installed at all agenings that convert be fully enabled (e.g., attic works) HVAC reser loads eaksubbed, documented, system dauge documented; colds matched Duct agatem design documented & property feetabled DR duct system tested Chick box if bested DI No air handling regispeed or destatook installed in groups continuous air barrier required in adjacent assembles. Rooms prosiste balanced lasting transfer grills or jump ducts as required OR tested (intect box if tested) DI What handling regispeed or destatook installed in property continuous air barrier required in adjacent assembles. Rooms prosiste balanced lasting transfer grills or jump ducts as required OR tested (intect box if tested) DI What handling regispeed or destatook installed for baths, interest, clothes diges; certiful secure system, etc. Contract formed-sin HWAC systemist have minimum MERV 8 filter, as filter begans. It is accoming generalizes A dobtional destandance system installed in the minimum MERV 8 filter, as filter begans. It is accoming generalizes A dobtional destandance control. See from efficient control; on heat is water nantors power merical or devel vertice (Exceptions - see specifications) Control Control in each security of heat is water nantors power merical and secul vertice (Exceptions - see specifications) Control Control in each security of heat is water nantors gover merical and secul vertice (Exceptions - see specifications) Control Control in each security of heat is water nantors gover merical and secul vertice (Exceptions - see specifications) Control Control Control control of the each security of the entities of the security of the entities of	The sealant text kits & instructional guidance for follow-up actions provided for buyer (Admission) see specification) The search of the provided services and the provided and specified surpo covers. Consession proof rederetibled screwms installed at all specifies that convert the fully sealed (e.g., attic works) If the services (e.g., documented, documented, springs duage, documented; colds markets) Duct system design documented & properly restalled BR duct system tested Duct system design documented & properly restalled BR duct system tested Recent provided in each cold dual street and the services of the s

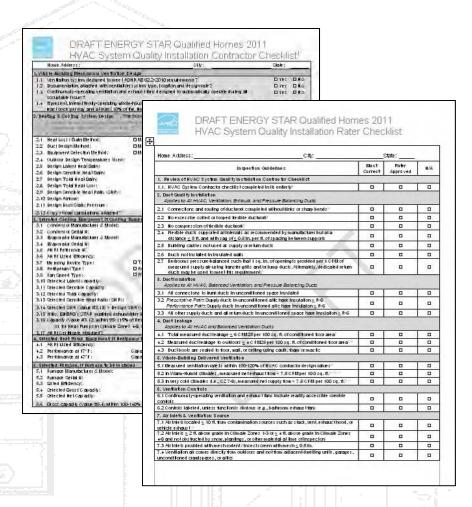


Moisture Control checklists equivalent = you choose



What About ENERGY STAR v3?

Address	or Oi	oller 123 Anystreet			
City/Sta	te/2)p	41.01	9	Venifie	d by
Section		Requirements (see Indoor airPLUS Construction Specifications for dotats)	19/4	Builder	Rate
	Bion	Managed Sto and Foundation		-	
	1.1	Site & foundation drainage: skeped grade, protected drain file, & foundation filer drains		8	D
	-	Capillary bosok below concrete slabs & in crawingacos (Exception - was specification)	D	1	D
		Posestation wall damp provided or water-proofed (Escept for homes without below-grade wells)	D	3	10
	100	Superments/crawfspaces insulated & conditioned (Exceptions - ser specification)	- 0	11	. 12
	-	Managed Wall Assemblies	_		-
3	3111	Continuous rivinage plane behind exterior clodding, properly fashed to foundation		D	13
Moliture Control	12224	Window & door openings fully flushed	100	п	- 58
5	200	Managed Roof Assemblies	_		
1		Sutters/downspouts direct water a minimum of 5' from foundation (Except in dry climates)	- 0	D	19
3	200	Fully flushed replikalit intersections (step & kick-out flashing) & roof penetrations		15	P
	-	Biturninous membrane installed at salinys & personations (Except in dry climates)	- 0	12	P
	-	to dealing installed at eases (Except in Climate Zones 1 + 4)	- 0	08	- 10
	1.	r Water Management			19
	limited to the same	Moisture-resistant materials/protective systems imtalked (i.e., flooring, tub/shower hacking, & piping)		п	13
	100	No saper barriers installed on litterior side of exterior walls with high condensation potential		10	D
-		No wet at water-damaged materials enclosed in building assemblies	-	111	2
Badon	10000	Approved radion-resistant husbares installed (Exception - see Specification)	D	1	- 1
#	2.2	Two sades 1est kits & instructionalguidance for follow-up actions provided for hoper (Admissing-See specification)	- 14	15	5
1	3.1	Foundation joints & penetrations scaled, including air-tight sump covers. Conscion proof redestifierd screems installed at all openings that covers be failly sealed for g., attic weeks!		- 0	- 3
in.	_	HVNC room loads calculated, documented, cystem daugn documented; cold matched			
	1000	Duct system design documented & properly installed DH duct system tested (inhack box if tested) (if	- 11		to
	4.2	Duct system design documented a property recount of duct system to see . (Creat our received in No air handing regispreent or dischark installed in groups, continuous air barrier required in adjacent assembles.)	- 17		. 12
200	-	Rooms pressure balanced (asing transfer grills or jump ducts) as required OR tested. (check box if tested) D			- 0
*	4.4	Room pressure between tissing warrow great or jump docum as required on traces (trace documents) as Whole house contribution protein included in most ASHREF 62.2 inquirements.	- 10	-	1
	4.6	Local enhance verification to cutdoors installed for baths, litteres, citches dryers, centus vacuum system, etc.			19
	4.7	Contral forced-air HWAC systemist have minimum MERV 8 filter, no filter bypaes, & no ocone generators			1
Cembustion Polisharis		Additional detunishination systemical or central MWC definenciation controls installed (in water-humal citrories cells)	1	1	10
	-	naster Source Cortinis	1	-	-
	5.3	Gas hast direct verted; oil heat & water heaters power winted or direct verted (Exceptions - see specifications)	T ti		1 9
	9.2	Fingstaces/houring stones norted outdoors & most omissions/efficiency standards/restrictions	0		10
	5.3	Certified CO alarms installed in each sleeping zone (e.g., common hallway) according to NFPA 720			12
8		Sending prohibited in common areas, outside sending at least 25' from hallding openings (Matt-forstly horses only)	100	11	10
Combus	-	hed Garger limbtion	1		
	5.5	Commun wallsterlings thease & gategal arrounded before insulation installed; house dears gastered & clear installed.	-11		1 8
	5.6	Exhaust has fermionize 70, the, rated for continuous used installed in gatage & control to outstook (controls optional)	-11] 13
20	6.1	Certified low-formuldehyde pressed wood majorials used (i.e., plywood, QSB, MDF, cabinety)		K	1
Autribis	6.2	Certified low-VOC or no-VOC interior paints & finishes used		190	1
3	6.3	Carpet, adhesives. & cashion qualify for CRI Green Label Plus or Green Label bedling program	13	18	L
1	7.1	HERC system & ductorek verified dry. Heart, & property installed		1	- 8
3	7.2	Home ventilated before secupacity QR initial contration instructions provided for buyer		TW	- 5
-	7.3	Completed checklist & other required documentation provided for buyer		09	0
Ration	Provid	on: Tess N. Certify Bill Di	+w	right	



HVAC Checklists streamline 4.1, 4.2, 4.5, 4.6, & 7.1



FAQ's and Other Tips

- Do I need a special certification or training?
- Indoor airPLUS for Existing Homes?
- What happens to Indoor airPLUS in 2011?
- Do I need to sign a separate Partner Agreement?
- Do I need extra visits to the site?



Indoor airPLUS Label









EPA 402N-06/003 | January 2009 | www.epa.gov/indoorsirplus

Indoor airPLUS CONSTRUCTION SPECIFICATIONS

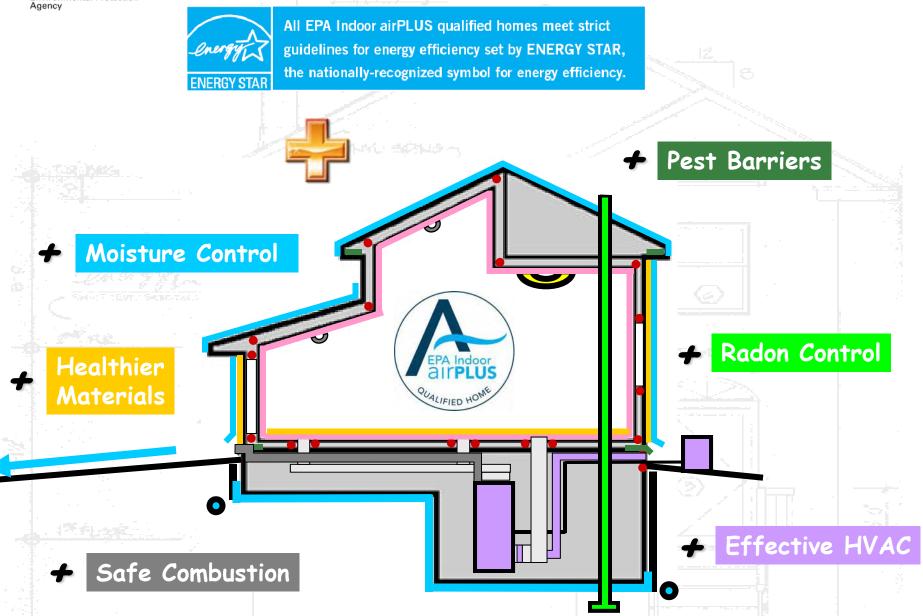


Let's look inside

Indoor Air Quality (IAQ)



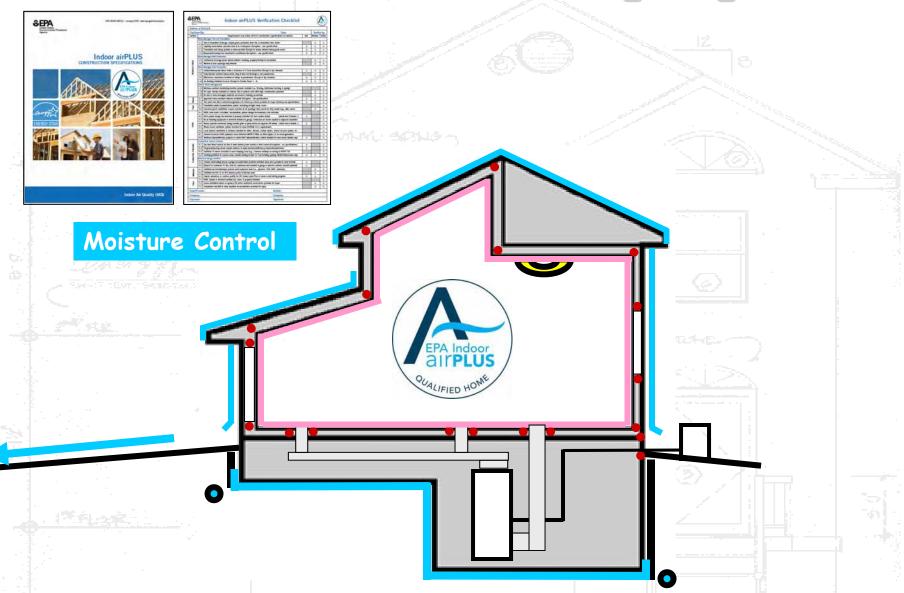
ENERGY STAR





Indoor airPLUS High 1918

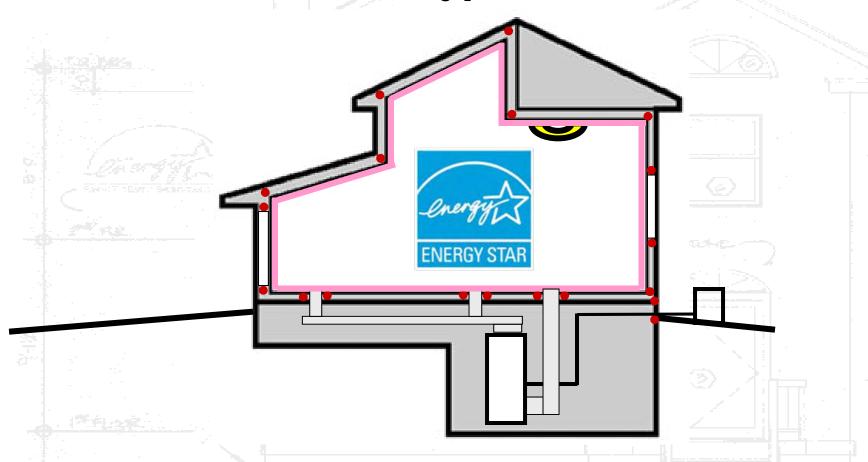






1. Moisture Control

Starts with the ENERGY STAR Thermal Bypass Checklist



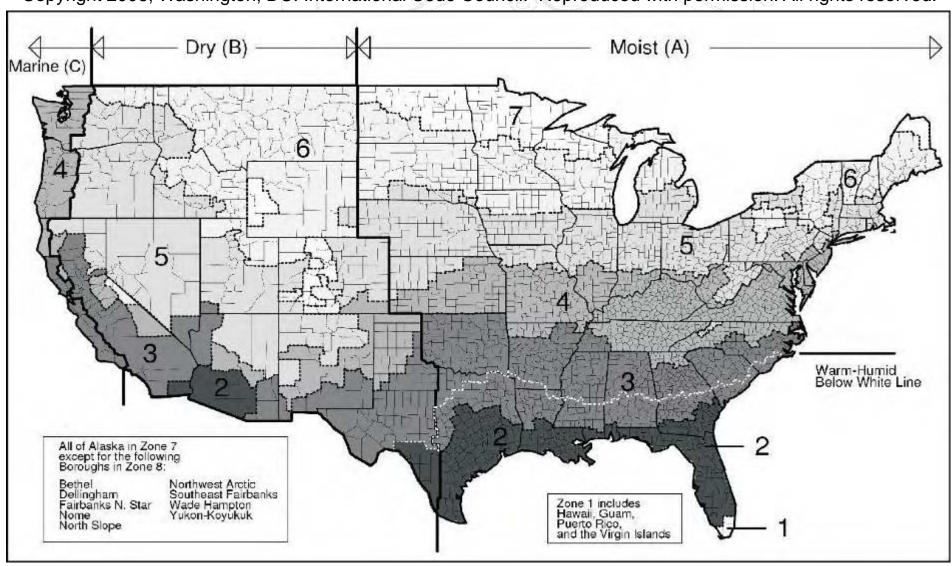
And continues with Indoor airPLUS



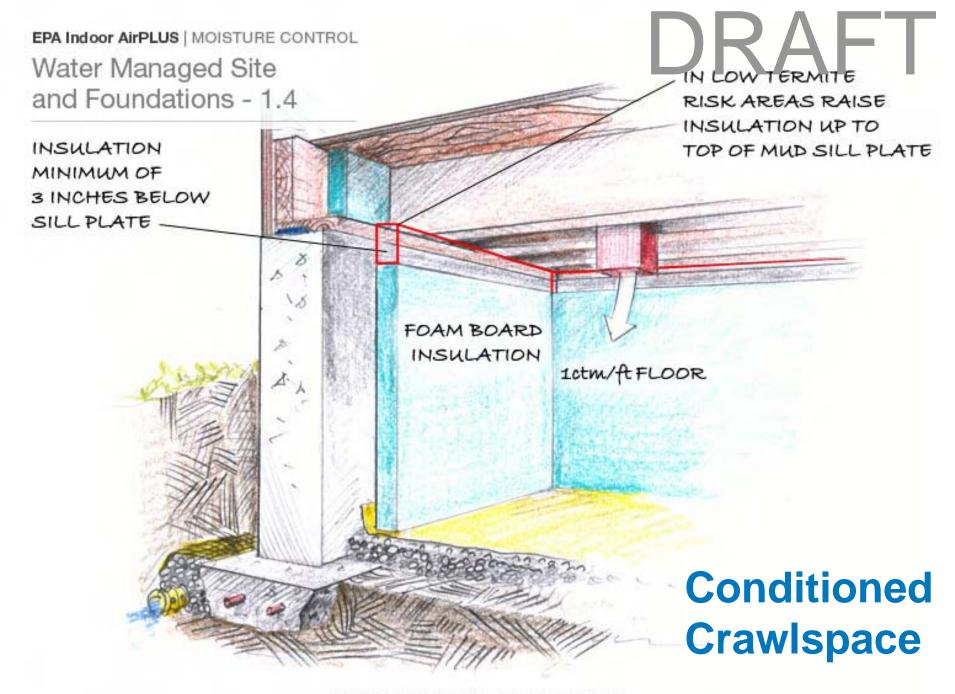
For Climate Exceptions

Figure 301.1, 2006 International Energy Conservation Code®

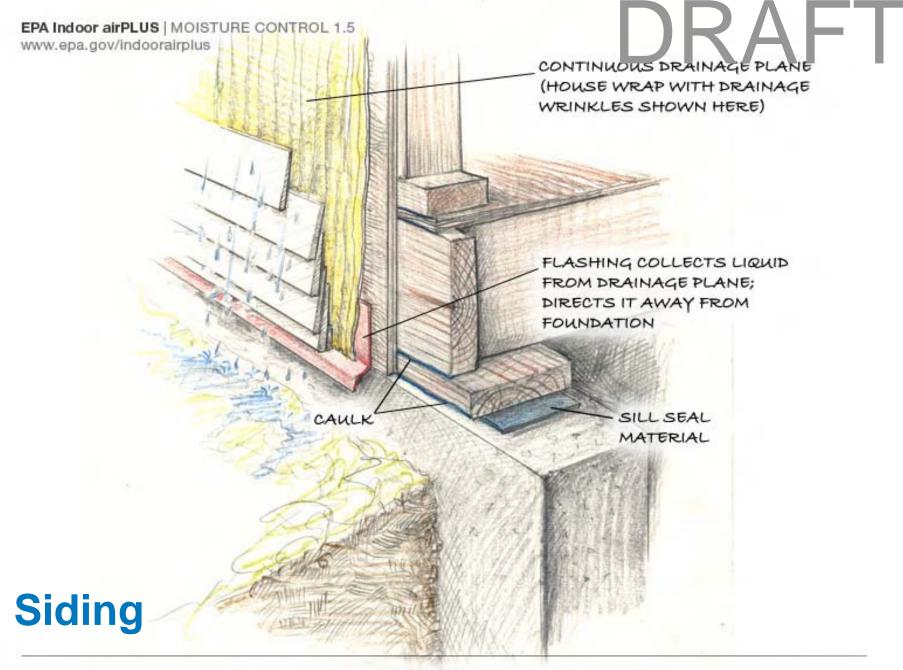
Copyright 2006, Washington, DC: International Code Council. Reproduced with permission. All rights reserved.



DRAFT SEAL SLAB EPA Indoor AirPLUS | MOISTURE CONTROL EDGE TO WALL Water Managed Site and Foundations - 1.2 FOAM BOARD INSULATION **Basement** APPROVED VAPOR RETARDER (中山· M.3.1.4) COARSE CRAVEL (NO FINES) BASE COURSE DR DRAINAGE MAT



CONDITIONED AIR OPTION



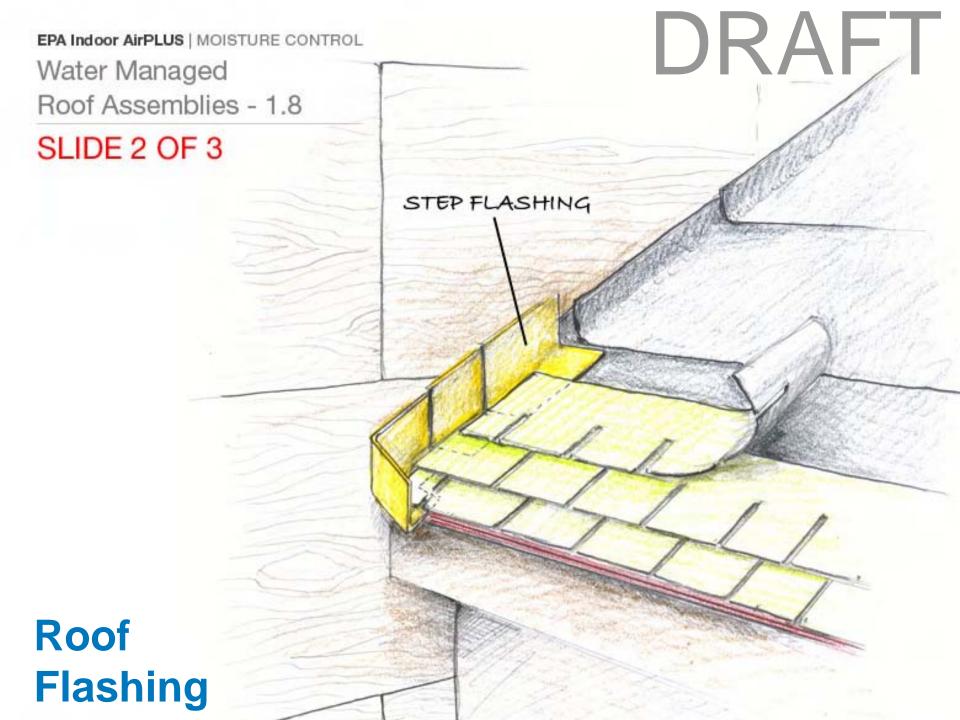
SIDING WITH DRAINAGE PLANE AND FLASHING

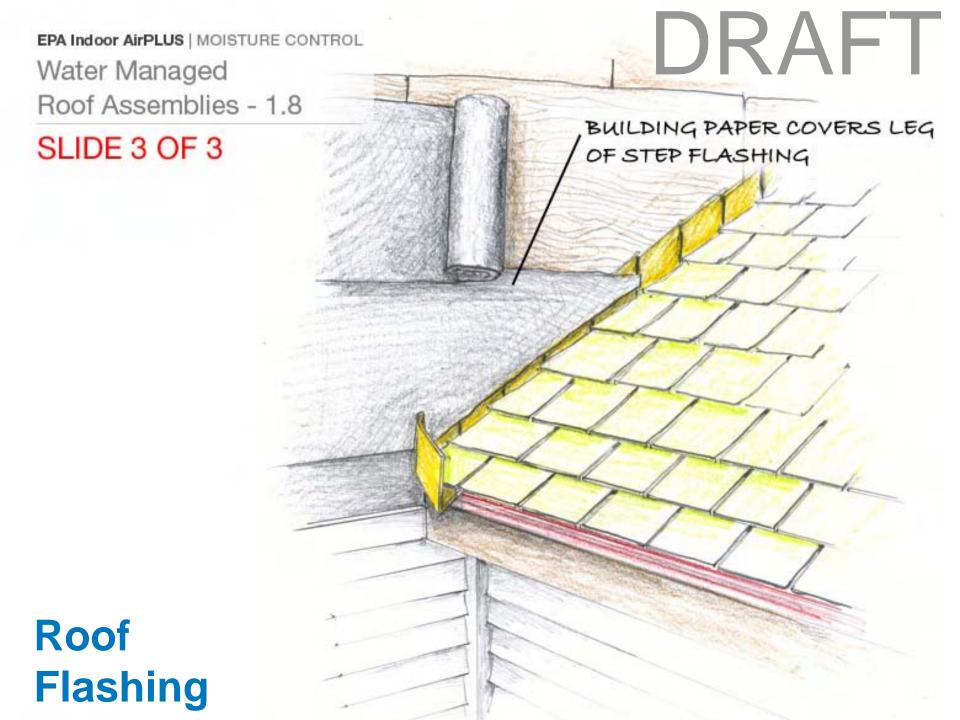


1.6 Fully Flash Windows & Doors



DRAFT EPA Indoor AirPLUS | MOISTURE CONTROL Water Managed Roof Assemblies - 1.8 SLIDE 1 OF 3 SHEATHING OF UPPER WALL ROOFING FELT KICK OUT FLASHING Roof **Flashing**

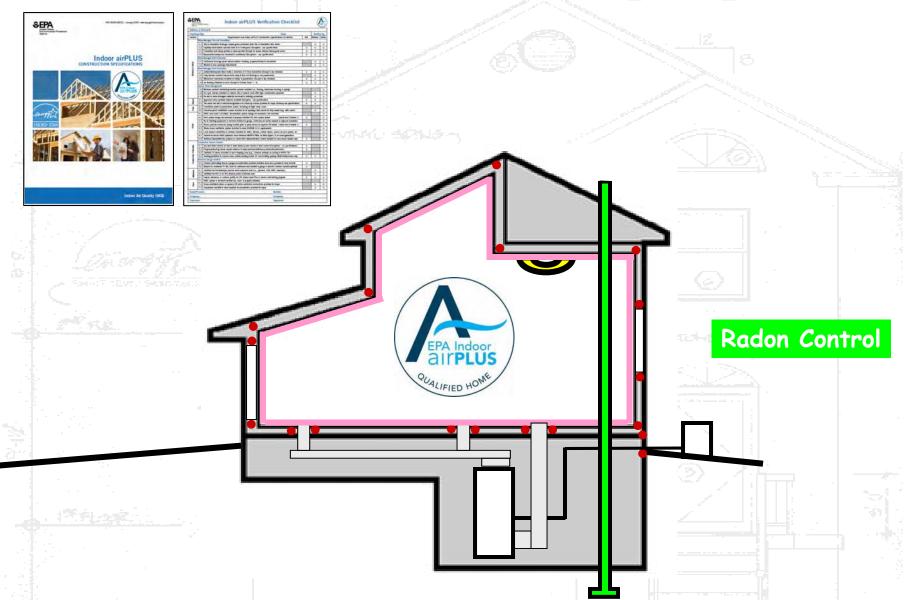






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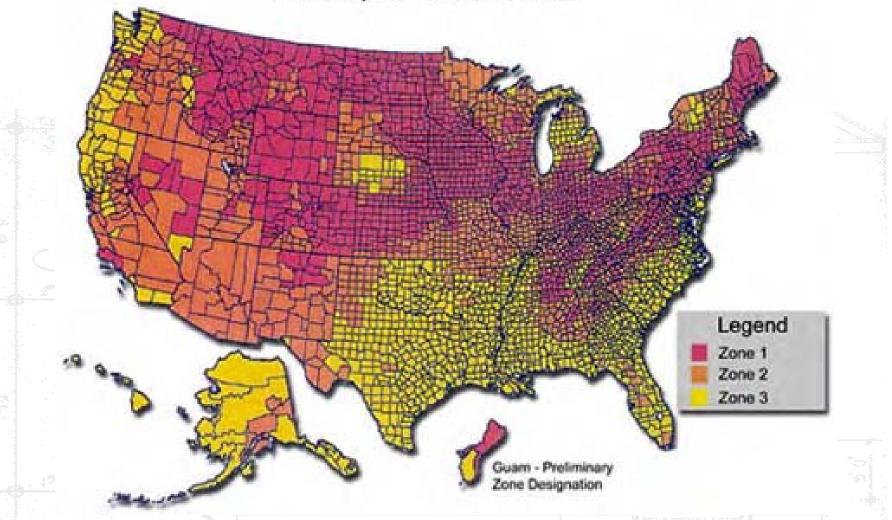






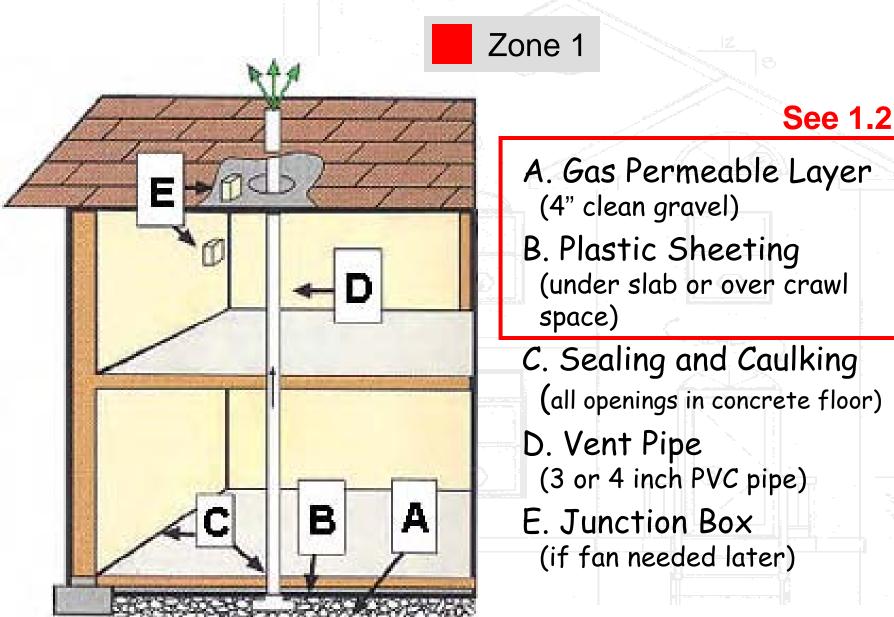
Note: High levels of Radon can be found in any home.

EPA Map of Radon Zones





2.1 Radon Resistant New Construction





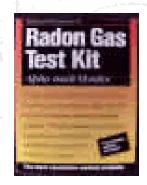
2.1 Radon Resistant New Construction





2.2 Provide buyer 2 Radon test kits





Long Term Test Kits (Alpha Track)





Short Term Test Kits (Charcoal)

http://www.epa.gov/radon/radontest.html



Indoor airPLUS







3.1 Seal foundation joints/penetrations3.2 Pest screens



Air Sealing

Detailed specification guidance

3. Pest Barriers

- 3.1 Minimize pathways for pest entry by sealing penetrations and joints in and between foundation and exterior wall assemblies, with blocking materials, foam, and polyurethane caulk or equivalent. In addition, sump pit.
- 3.2 Provide corrosion-proof rodent/bird screens (e.g., copper or stainless steel mesh) for all building openings that cannot be fully sealed and caulked (e.g., ventilation system intake/ exhaust outlets and attic vent openings). This requirement ary does not apply to clothes dryer vents.
 - Foundation walls should be solid concrete or masonry with top course of solid block, bond beam, or concrete-filled block: AND
 - Interior concrete slabs should be constructed with 6 in. x 6 in. welded wire fabric or equivalent, and concrete walls with reinforcing rods to reduce cracking; AND
 - . Sill plates should be of preservative-treated wood.
 - Additional precautions in areas subject to "Very Heavy" termite infestation probability as identified by IRC Figure 301.2(6) (i.e., AL, FL, GA, LA MS, SC, and parts of CA and TX):
 - 3.2 Provide corrosion-proof rodent/bird screens (e.g., copper or stainless steel mesh) for all building openings that cannot be fully sealed and caulked (e.g., ventilation system intake/ exhaust outlets and attic vent openings). This requirement does not apply to clothes dryer vents.

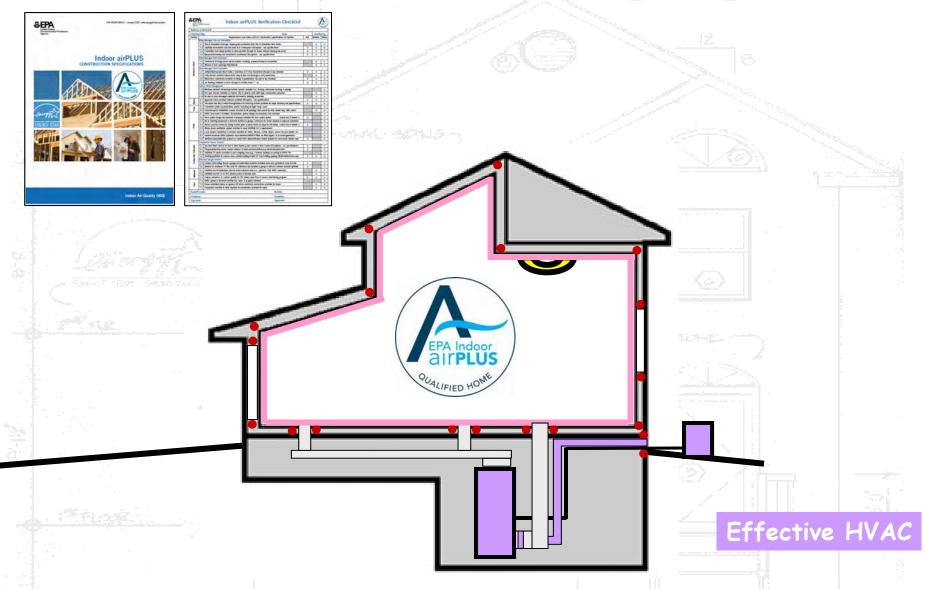






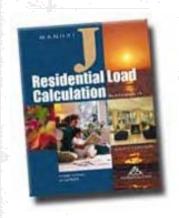
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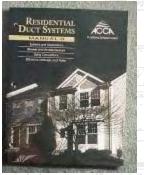




4.1 HVAC load calc's documented 4.2 Duct design documented 4.3 No HVAC in garages



HVAC







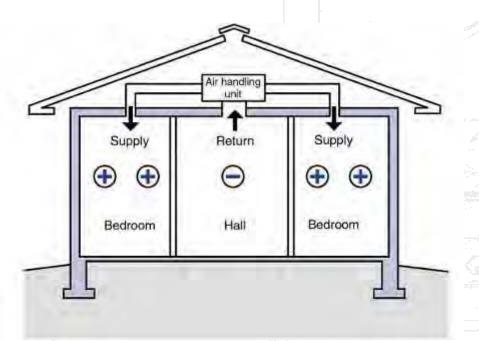
Documented



Field Verified



4.4 Rooms pressure balanced







JUMP DUCT

OR Pressure Tested ≤ 3 Pa

TRANSFER GRILLE



4.5 Whole House Ventilation 4.6 Local Exhaust Ventilation

LOCAL EXHAUST







BALANCED VENTILATION & HRV/ERV's

FRESH AIR DAMPER





DUCTED FRESH AIR SUPPLY



A House Needs to Breathe, Right?

TABLE 4.1a (I-P)
Ventilation Air Requirements, cfm

	Bedrooms				
Floor Area (ft2)	0-1	2-3	4-5	6-7	>7
<1500	30	2 45 G	60	75 🕝	90
1501-3000	45	60	75	90	105
3001-4500	60	75	90	105	120
4501-6000	75	90	105	120	135
6001-7500	90	[©] 105 [©]	120	135	150
>7500	105	120	135	150	165



4.7 MERV 8 Filter, No by-pass, & No Ozone Generating Systems

Specific Specification Guidance

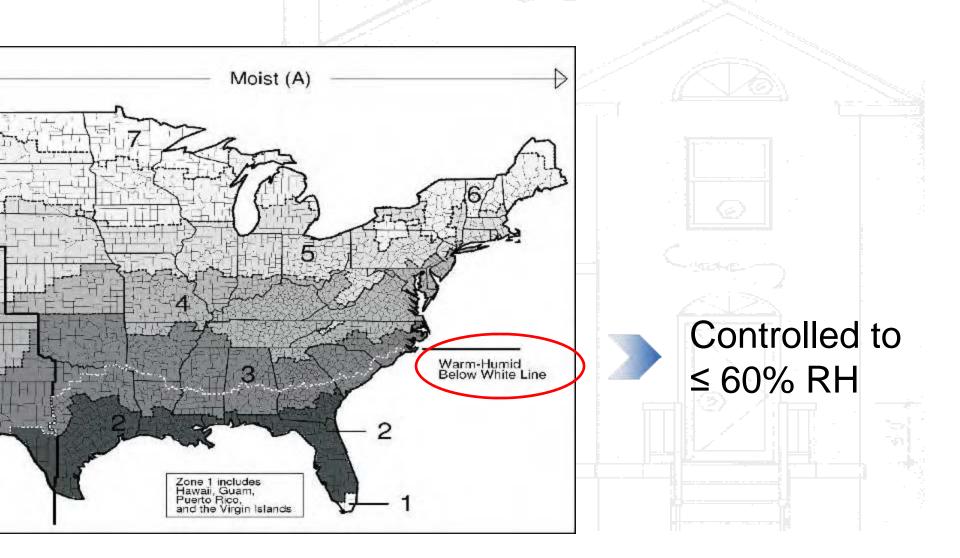
Air Cleaning and Filtration

- 4.7 Central forced-air HVAC systems shall include a filtration system meeting the following requirements:
 - No air cleaning equipment that intentionally produces ozone (rather than as an incidental by-product) shall be installed.
 - HVAC filters shall be rated MERV 8 or higher according to ASHRAE 52.2 (at ~295 fpm).
 - There shall be no visible bypass between the filter and the filter rack.
 - Filter access panel shall include a gasket or comparable sealing mechanism to prevent air leakage, and shall fit snugly against the exposed edge of the installed filter when closed to prevent bypass.





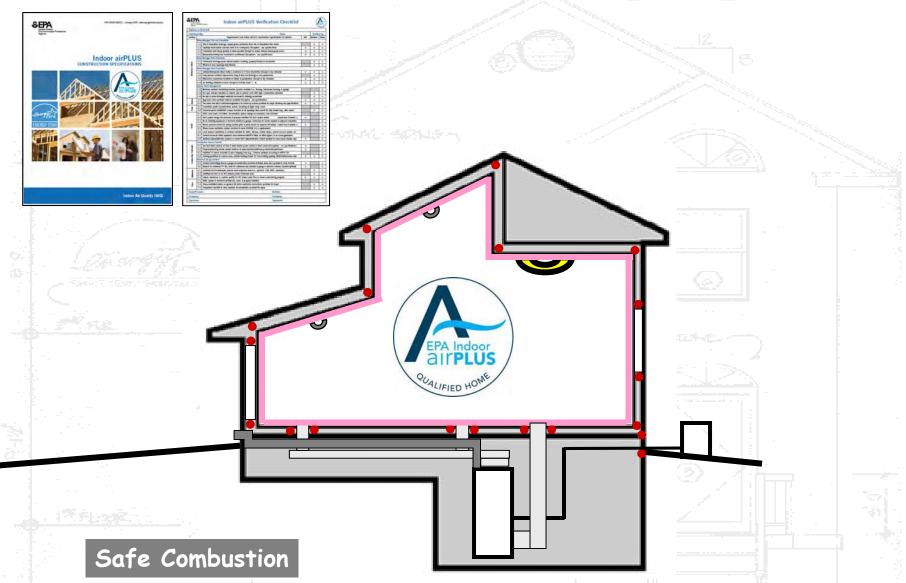
4.8 Independent dehumidification control in warm humid climates





Indoor airPLUS







5.1 Power Venting & Direct Venting



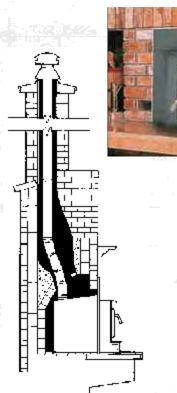
POWER VENTED WATER HEATER

DIRECT VENTED FURNACE





5.2 Fireplaces & Stoves Certified









Specific Specification Guidance

- 5.2 Fireplaces and similar fuel burning appliances located in conditioned spaces shall be vented to the outdoors and supplied with adequate combustion and ventilation air according to manufacturers' installation instructions AND shall meet the following energy efficiency and emissions standards and restrictions:
 - Masonry fireplaces are not permitted, with the exception
 of "masonry heaters" as defined by ASTM E1602, and
 the IBC, section 2112.1 (i.e., fireplaces engineered to
 store and release substantial portions of heat generated
 from a rapid burn).
 - Factory-built, wood-burning fireplaces shall meet the certification requirements of UL 127, and meet the emission limits in EPA 40 CFR Part 60.
 - Natural gas and propane fireplaces shall be power vented or direct vented, as defined by NFPA 54, section 3.3.108, have a permanently fixed glass front or gasketed door, and comply with ANSI Z21.88/CSA 2.33.
 - Wood stove and fireplace inserts as defined in Section 3.8 of UL 1482, shall meet the certification requirements of that standard, and shall meet emission requirements of EPA 40 CFR Part 60 and WAC 173-433-100 (3).
 - Pellet stoves shall meet the requirements of ASTM F1509
 - Decorative gas logs as defined in K.1.11 of NFPA 54 (National Fuel Gas Code) are not permitted.
 - Unvented combustion appliances are not permitted, with the exception of kitchen-type cooking devices with exhaust ventilation meeting ASHRAE 62.2 (section 5).



5.3 Certified CO Alarms5.4 No Smoking (multifamily)



CO ALARM





COMBINED CO & SMOKE ALARM



Enforceable policy in Multi-family buildings



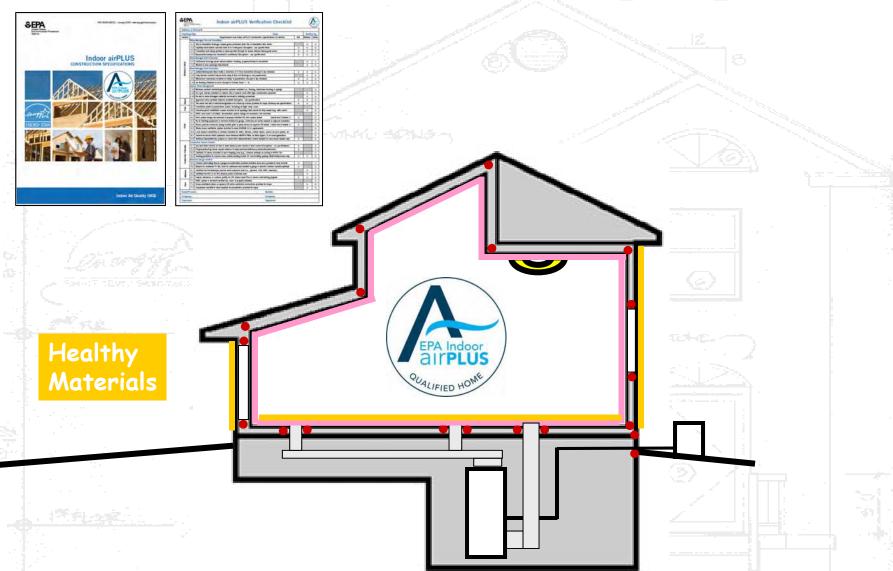
5.5 Garage common walls/ceilings sealed5.6 Exhaust fan (≥70 cfm)





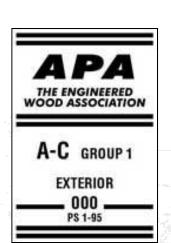
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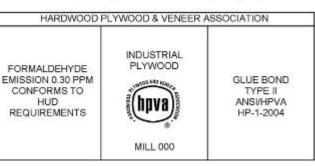






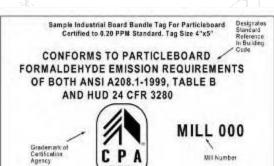
6.1 Pressed wood materials: certified low formaldehyde



















6.2 Interior paints/finishes low emitting6.3 Low emitting carpets, pads

Paints:









Carpeting:





or CA Section 01350:

chps.net/manual/lem_table.htm



SEPA Indoor airPLUS

A new opportunity for leading builders to create better environments inside and out



Learn more at:

www.epa.gov/indoorairplus

OR contact the Indoor airPLUS Team at

iap@icfi.com